CLEANUP ACTION PLAN

South Kenyon Street Bus Yard Site
110, 130, 150, and 200 South Kenyon Street
Seattle, Washington

Voluntary Cleanup Program No. NW1977

Submitted to:

City of Seattle Attorney's Office
P.O. Box 94769
Seattle, Washington 98124

Submitted by:

AMEC Earth & Environmental, Inc.
11810 North Creek Parkway North
Bothell, Washington 98011

March 31, 2009

AMEC Project No. 8-915-16289-A

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Seattle City Attorney's Office
P.O. Box 94769
Seattle, Washington 98124

Attention: Kathy Gerla, Esq.

Subject: **Cleanup Action Plan**
South Kenyon Street Bus Yard Site
110, 130, 150, and 200 South Kenyon Street
Seattle, Washington
Voluntary Cleanup Program No. NW1977

Dear Ms. Gerla:

AMEC Earth & Environmental, Inc. is pleased to submit this Cleanup Action Plan for the above-referenced property located in Seattle, Washington. This report has been prepared for the exclusive use of the City of Seattle, in accordance with generally accepted environmental practice.

We appreciate the opportunity to work with the City of Seattle on this project. If you have any questions or desire further information, please feel free to contact the undersigned at (425) 368-1000 or (253) 572-0516.

Sincerely,

AMEC Earth & Environmental, Inc.

Meg Strong, L.Hg.
Senior Associate

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EXECUTIVE SUMMARY

This Cleanup Action Plan has been prepared for the City of Seattle Attorney's Office for the remediation of contaminated soil at the property known as the South Kenyon Street Bus Yard Site (Site) on South Kenyon Street, in south Seattle, Washington. This document has been prepared in general accordance with Model Toxics Control Act (MTCA) Cleanup Regulations Chapter 173-340 of the Washington Administrative Codes (WAC).

The Site occupies approximately 9 acres and is generally flat and unpaved. The Site is used for parking and maintenance of school buses and tour coaches. The structures onsite include one office, two maintenance shops, and a fueling station. The remedial investigation (RI) conducted during 2008 has identified the presence of contaminated soil and groundwater. This document addresses the remediation of soil onsite.

Three distinct areas of soil contamination were identified in the RI (AMEC 2009a). Those are Area 1: Fueling Station, Area 2: Starline Maintenance Shop located in the eastern portion of the Site, and Area 3: Former Wrecking Yard located in the western portion of the Site. In addition, localized areas of contamination were also identified adjacent to the First Student Maintenance Shop and in the eastern portion of the Site. The cleanup levels deemed appropriate for the Site are MTCA Method A Unrestricted Use levels. Comparison of the contaminant levels with the cleanup levels indicates that contaminants are present at depths ranging from 0.5 to 17 feet below existing grade. The indicator hazardous substances in the soil onsite are total petroleum hydrocarbons, benzene, arsenic, and lead.

The remedial action objectives (RAOs) were established in a *Focused Feasibility Study* (AMEC 2009b). Those RAOs include minimization or elimination of further release of contaminants to the groundwater and mitigation of the surface and near-surface contamination to prevent contact by humans and ecological receptors. An estimated total of 27,000 cubic yards, or approximately 40,000 tons, of contaminated soil is present on the Site.

Five remedial alternatives were developed and evaluated using the RAOs and seven criteria, as specified by WAC 173-340-360, *Selection of Cleanup Actions* (AMEC 2009b). Alternative 5, Removal and Off-Site Disposal, where the contaminated soil is excavated and disposed offsite in a permitted landfill, was selected as the most appropriate remedial approach for this Site.

Contaminated soil will be excavated and disposed offsite. The limits of the excavation areas will be defined by confirmation sampling results from samples collected from the sidewalls and excavation bottoms. The sampling frequency will follow available guidelines (e.g., *Guidance for Remediation of Petroleum Contaminated Soils* [Ecology 1995]) and professional judgment. Following completion of the removal action, the excavations will be backfilled to the original grade with imported clean material. Downgradient, perimeter monitoring wells will be monitored post remediation to evaluate the groundwater contamination and natural attenuation parameters.

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1.0 INTRODUCTION

AMEC Earth & Environmental, Inc. (AMEC) has prepared this Cleanup Action Plan (CAP) for the City of Seattle (City) Attorney's Office for the property known as the South Kenyon Street Bus Yard Site (Site) located on South Kenyon Street, in Seattle, Washington (Figure 1). This document has been prepared in general accordance with Model Toxics Control Act (MTCA) Cleanup Regulations Chapter 173-340 of the Washington Administrative Codes (WAC), under the Voluntary Cleanup Program for this Site (Ecology No. NW1977).

1.1 Purpose

The purpose of this CAP is to present the approach for the remediation of soil onsite impacted by chemicals of concern (COCs). The removal of the impacted soil will prevent or substantially minimize releases of pollutants into the groundwater and allow redevelopment of the Site for new commercial uses without further environmental concerns. Remedial measures for the contaminated groundwater will be evaluated after completion of the soil cleanup action, based on the groundwater conditions at that time.

1.2 Report Organization

This document presents a brief background of the Site, findings of the remedial investigation (RI), remedial alternatives considered, remedial action objectives (RAOs) and performance criteria, implementation of the selected alternative, and monitoring. Individual sections of the report are as follows:

- Section 1 – Introduction
- Section 2 – Summary of Site Conditions
- Section 3 – Cleanup Requirements
- Section 4 – Selected Site Cleanup Action
- Section 5 – Alternatives Considered
- Section 6 – Cleanup Action Implementation
- Section 7 – Compliance Monitoring
- Section 8 – Schedule for Implementation
- Section 9 – Schedule

2.0 SUMMARY OF SITE CONDITIONS

This section presents a summary of the site conditions as described in the RI report, *South Recycling and Disposal Station - Bus Yard, 110, 130, 150, and 200 South Kenyon Street, Seattle, Washington* (AMEC 2009a).

2.1 Site Description

The Site is located in the Duwamish-Southpark industrial area of Seattle and is bordered to the south by South Kenyon Street, to the west by State Route (SR) 509, to the east by SR-99, and to the north by an exit road from SR-509 to SR-99 (Figure 2). Adjacent properties and the surrounding area are commercially developed and include storage yards, warehouses, and light manufacturing facilities. Kenyon Business Park is located on the south side of South Kenyon Street.

The irregularly-shaped Site is 9.12 acres in size and consists of four contiguous parcels with listed addresses of 110, 130, 150, and 200 South Kenyon Street. The buildings onsite include a 500-square foot (sq ft) abandoned office at 110 South Kenyon Street, a 10,340-sq ft maintenance shop/office at 130 South Kenyon Street operated by First Student, Inc. (First Student), and an 8,220-sq ft maintenance shop/office at 150 South Kenyon Street operated by Starline Luxury Coaches (Starline) and Curtis Transportation Service. A fueling station, including a canopy, pump island with dispenser, and a 12,000-gallon diesel underground storage tank (UST) are also present in the central area of the Site. Other Site features include two concrete-paved bus wash areas, and one oil water separator (Figure 2).

A vegetated, perimeter stormwater collection ditch surrounds the Site to the west, north, and east. The parcel at 110 South Kenyon Street (western parcel) is separated from the rest of the property by a partially grass-lined, perimeter stormwater collection ditch on the east and north sides. This ditch drains to the perimeter stormwater collection ditch on the west side.

The topography of the main yard is generally flat with a gentle slope to the east and northeast. The ground surface elevations in this yard range from Elevation 18 above mean sea level (MSL) on the west to Elevation 14 MSL on the east. The topography of the western parcel is also generally flat with a gentle slope from the southwest to the northeast. The ground surface elevations in this yard range from Elevation 19 MSL on the southwest to Elevation 17 MSL on the northeast.

The main yard is mostly unpaved and is covered by ½-inch minus crushed rock. Small segments of asphalt are present on the west side of the First Student Maintenance Shop and on the east and north sides of the Starline Maintenance Shop. The fueling station and bus wash areas are paved with concrete. Approximately 60 percent of the western parcel is paved with concrete, and the remainder is unpaved and is covered with ½-inch minus crushed rock. Numerous ruts and depressions are present across the Site.

The roof runoff from the First Student Maintenance Shop drains into the ditch separating the western yard from the main yard (remainder of the Site). The discharge from the bus wash

station to the north of the First Student Maintenance Shop reportedly is connected to an oil water separator connected to the sanitary sewer. A buried stormwater main traverses the western parcel diagonally from the south to the west. Available information indicates the line is a 30-inch diameter, corrugated metal pipe, installed at approximately 15 feet below grade. Some of the stormwater on the western yard is captured by two catch basins, which drain into a manhole for the storm sewer main. The rest of the stormwater runoff from this parcel drains into the perimeter ditch to the north and east.

The stormwater from the Starline bus wash station and the Starline Maintenance Shop roof runoff are conveyed into a subsurface pipe traversing the Site from the fueling station to South Kenyon Street. One lateral pipe conveys some of the surface stormwater runoff via two catch basins to the perimeter ditch. The uncaptured stormwater runoff from the main yard directly infiltrates or drains into the perimeter ditch around the property. The perimeter ditch also receives the overflow from a detention basin to the north of the exit road via a 24-inch diameter culvert on the north side. The perimeter ditch appears to drain into a subsurface storm sewer at South Kenyon Road.

The utilities connected to the structures onsite enter the Site from South Kenyon Street. All power lines entering the Site and within the yards appear to be overhead.

2.2 Site History

The Site history, as described by G-Logics in a draft Phase I Environmental Site Assessment (May 18, 2007) is summarized in the Remedial Investigation Report for this site (AMEC 2009a).

2.3 Site Contaminants

Results from the RI conducted during 2008 indicate that Site soil is contaminated with gasoline, diesel, and oil range hydrocarbons; methyl tertbutyl ether (MTBE); benzene; total xylenes; methylene chloride; naphthalene; benzo(a)pyrene; carcinogenic polycyclic aromatic hydrocarbons (cPAHs); arsenic; cadmium; chromium; and lead. The primary COCs which define the extent of contamination and cleanup in Site soil are total petroleum hydrocarbons (TPH) (gasoline, diesel, and oil), benzene, arsenic, and lead. The RI identified three main areas of soil contamination which are: First Student Fuel Station/Canopy area (Area 1), Starline Maintenance Shop (Area 2), and the Former Wrecking Yard (Area 3). These areas are illustrated on Figure 3. In addition, singular detections of one or more COCs (*e.g.,* cPAHs, chromium, and lead) were detected in isolated locations such as in the northern portion of the First Student Maintenance Shop (boring FSB), northeast and southeast of the Starline Maintenance Shop (boring B33 and B5, respectively), and in the eastern portion of the Site (boring B75). All locations are illustrated on Figure 3.

Gasoline and diesel range hydrocarbons, cPAHs, and lead are present in the First Student Fuel Station/Canopy area (Area 1). Elevated concentrations of these COCs occur within the 0 to 4 foot below ground surface (bgs) depth interval.

Diesel and heavy oil range hydrocarbons, metals (arsenic, cadmium, and lead), and cPAHs were detected in shallow soil samples (upper 4 feet) surrounding the northern portion of the Starline Maintenance Shop (Area 2).

Elevated concentrations of lead, arsenic, and cadmium are present in a cement kiln dust (CKD) layer in Area 3. The CKD was observed between the ground surface and 11 feet bgs. Data presented in the RI indicates that these metals in the CKD are non-leachable (AMEC 2009a). Diesel and heavy oil range hydrocarbons are also present in the shallow soil in Area 3 (0.5 to 3 feet bgs). Gasoline range hydrocarbons and gasoline constituents are present in the CKD as well as below CKD layer in Area 3 to a maximum depth of 17 feet bgs.

2.4 Conceptual Site Model

The Site is zoned for industrial use and the surface is covered predominantly by crushed gravel. The areas adjacent to building structures onsite (First Student Fuel Station/Canopy area, First Student Maintenance Building, and Starline Maintenance Shop) are covered by asphalt and/or concrete. Site soil consists of multiple layers of fill extending to approximately 11 feet bgs in the western portion of the Site. Native soil below the fill consists of alluvial and glacial deposits. Fill materials beneath the Site consist of sandy silt, gravel, wood fragments and roots, and the Duwamish River dredge spoils known as “black Duwamish Sand.” One unit of the fill material consists of CKD, which underlies the Former Wrecking Yard Area (Area 3) and contains metals (arsenic, cadmium, and lead). The thickness of CKD ranges from 0.5 to 11 feet and is the thickest in the western and central portions of Area 3. The native alluvial deposits of the Duwamish River consist of gray micaceous fine-grained silty sand and olive-brown silt with fine-grained sand and fine organics, which extend to the approximate depth of 40 feet bgs. Glacial deposits consist of very dense glacial till which extends to depths of at least 116 feet bgs (SPU 2009).

The potential exposure routes and receptors for contaminants in Site soil are as follows:

- Contact (dermal, incidental ingestion, or inhalation) by visitors, workers, and potential future other Site users with hazardous substances in soil;
- Contact (dermal, incidental ingestion, or inhalation) by terrestrial wildlife (small mammals and birds) with hazardous substances in soil; and
- Contact by terrestrial plants and soil biota to hazardous substances in soil.

Potential receptors are the general public, facility personnel, and construction workers. In proximity of the Site, there are no significant ecological or habitat potential receptors, except plants and soil biota.

3.0 CLEANUP REQUIREMENTS

The MTCA cleanup regulations provide that a cleanup action must comply with cleanup levels for identified COCs, points of compliance, and applicable or regulatory requirements, based on federal and state laws (WAC 173-340-710). The Site cleanup levels, points of compliance, and

the applicable regulatory requirements for the selected cleanup remedy are briefly summarized in the following sections.

3.1 Human Health and Environmental Concerns

The existing COCs in Site soil present a hazard to personnel onsite that may come into contact with the contaminated soil during any earth-disturbing activity. The anticipated future developments onsite will include demolition of the existing structures above and below grade and construction of new buildings and subsurface utilities onsite. Both of these activities will expose the workers to the Site contaminants. Also at risk are the terrestrial receptors. Terrestrial ecological evaluations (TEEs) were performed as part of the RI. For the purposes of the TEEs, chemicals that exceeded unrestricted land use soil screening concentrations in WAC 173-340-900 (Table 749-2) were also identified as COCs.

Contaminated soil is a potential source of groundwater contamination onsite, which may impact other receptors downgradient of the Site. Following the removal of the contaminated soil onsite, the groundwater will be monitored to assess the groundwater quality post remediation.

3.2 Indicator Hazardous Substances

Under MTCA, “indicator hazardous substances" means the subset of hazardous substances present at a site for monitoring and analysis during any phase of remedial action for the purpose of characterizing the site or establishing cleanup requirements for that site. Washington State Department of Ecology (Ecology) may eliminate consideration of those hazardous substances that contribute a small percentage of the overall threat to human health and the environment at a site that is contaminated with a relatively large number of COCs (WAC 173-340-703). The remaining COCs can then serve as indicator hazardous substances for purposes of defining site cleanup requirements.

As discussed in Section 2.3, the primary COCs identified at the Site include: TPH, benzene, arsenic, and lead. While these contaminants may not represent the total hazard from this site, their cleanup to the MTCA Method A for unrestricted use will include the removal of the other contaminants.

3.3 Cleanup Levels

Cleanup standards consist of 1) cleanup levels that are protective of human health and the environment; and 2) the point of compliance at which the cleanup levels must be met. To eliminate worker exposure to Site COCs during development activities at the Site and to protect the groundwater, the cleanup levels under MTCA Method A for unrestricted use were selected for the Site COCs. Table 1 presents the list of COCs and the associated cleanup levels.

3.4 Points of Compliance

Under MTCA, the point of compliance is the point or location on a site where the cleanup levels must be attained. The standard point of compliance for the soil cleanup levels shown in Table 1 will be throughout the soil column from the ground surface to 15 feet bgs, in accordance with

WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). However, subject to final engineering and remedial design analyses, there will likely be limited areas of the Site where attainment of soil cleanup levels to 15 feet bgs is impracticable due to safety or engineering concerns. For example, in the western portion of the Site, COC-impacted soil is present at the property boundary to a depth of 17 feet bgs. Due to the proximity of the contamination to the property boundary and the required shoring, it may not be feasible to remove the contaminated soil to 15 feet bgs because of limitations related to safety and engineering design. Where impractical to remove the contaminated soil above 15 feet bgs and consistent with WAC 173-340-740(6)(f), clean soil will be placed above the remnant COC-impacted soil and other mitigative measures will be evaluated. Cleanup specifications for localized areas where COC-impacted soil will remain onsite will be developed during the design, as appropriate. Additional mitigative measures such as the application of oxygen-releasing compound and installation of a soil vapor extraction sparge system may be considered following the evaluation of the extent of COC-impacted soil remaining onsite.

3.5 Applicable Regulatory Requirements

In addition to the cleanup standards developed through the MTCA process and presented in Section 3.3, other regulatory requirements must be considered in the selection and implementation of the cleanup action. MTCA requires the cleanup standards to be "at least as stringent as all applicable state and federal laws" [WAC 173-340-700(6)(a)]. Besides establishing minimum requirements for cleanup standards, applicable federal, state, and local laws and ordinances may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710.

The following regulations apply to the soil and groundwater media at the facility, the health and safety of workers conducting cleanup actions at the facility, and the wastes generated by the cleanup action:

- The final disposition of the petroleum-impacted soil originating from the property will be evaluated using Ecology's Guidance for Remediation of Petroleum Contaminated Soils under WAC 173-340 and -360 (1995).
- The Department of Labor has published final rules (29 CFR Part 1910.120, March 6, 1990) that amend the existing Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations and emergency response. Within the State of Washington, these requirements are addressed in WAC 296-843, Hazardous Waste Operations. These regulations apply to the activities to be performed at this site as a site remediation, or cleanup, under the Federal Resource Conservation and Recovery Act of 1976 and/or the MTCA. The protocols described in a health and safety plan are designed to ensure compliance with state and federal regulations governing worker safety on hazardous waste sites, and the protection monitoring requirements of the MTCA found at WAC Chapter 173-340-410.
- The State Environmental Policy Act (SEPA) RCW 43.21C, and state and local implementing rules WAC 197-11 and Seattle Municipal Code Chapter 25.05, apply and will be complied with. Seattle Public Utilities (SPU), as lead agency for the proposal, has

already conducted SEPA review and issued a Determination of Non-Significance (DNS) for development of the transfer station. Prior to commencing cleanup actions, SPU will complete an evaluation under SEPA of additional information and possible impacts associated with the related cleanup of the property and replacement of the existing storm drain line in Area 3.

- Air Quality – Applicable for site grading or excavation work that could generate dust. Controls would need to be in place during construction (e.g., wetting or covering exposed soils and stockpiles), as necessary, to meet the substantive restrictions on off-site transport of airborne particulates by the local agency, the Puget Sound Clean Air (PSCA) Agency. In addition, regardless of whether any asbestos is identified, an Asbestos/Demolition Notification and filing fee must be submitted to PSCA Agency electronically before any friable asbestos removal or demolition begins. This applies to all structures to be demolished at the Site.
- Archeological and Historical Preservation – The Archeological and Historical Preservation Act (16 USCA 496a-1) would be applicable if any subject materials are discovered during design or site grading and excavation activities. A cultural resources assessment will be performed during the design to determine whether cleanup activities could affect historical archaeological remains that might be located in on-site fill, or affect prehistoric archaeological remains that could be located beneath the fill in past upland and marine locations.
- The City Department of Planning and Development (DPD) and Seattle Department of Transportation (SDOT) will require a Stormwater, Grading, and Drainage Permit prior to any earthwork that will result in excavation that is deeper that 3 feet and/or disturbs more that 100 cubic yards (CY) of soil. This permit will specify the excavation protection (shoring) methods, and temporary erosion and sedimentation controls during remedial actions. The Shoring and Excavation permit will not be required by SDOT unless the excavation will be conducted in or near a public right-of-way that could by the nature of the excavation affect the integrity of the right of way or utilities in the right of way. SDOT reviews any proposed excavation that would be greater than 3 feet deep immediately adjacent to any given public right-of-way.
- A City Side Sewer for Temporary Dewatering on Construction Sites Permit might be an appropriate requirement for the Site if dewatering is conducted during the remedial action. Dewatering operations are practices that manage the collection and discharge of surface and subsurface water that must be removed from a work location so that construction work can be accomplished. The Side Sewer Permit for Temporary Dewatering addresses location for discharges, pollutants, discharge volumes, report methods, payment to public agencies for use of existing facilities, monitoring and inspections, and is overseen by DPD and SPU. In addition, the King County Industrial Waste Program regulates wastewater discharges from construction site and requires permits. Regardless of discharge volumes and period of discharge, dewatering dischargers must meet King County permitting requirements.

- SPU will apply for coverage under the Department of Ecology's National Pollutant Discharge Elimination System/State Waste Discharge General Permit for Construction Stormwater, due to the potential for stormwater discharges associated with cleanup and replacement of the existing storm drain line.
- The permanent closure of UST containing diesel fuel will comply with UST Regulations (WAC 173-360). At least 30 days before beginning permanent closure of the UST, Ecology will be notified of the intent to permanently close the UST. Permanent closure shall be completed by a certified UST supervisor within 60 days after expiration of the 30-day notice. A Site Assessment Checklist will be also submitted to Ecology after the UST removal.
- Well Construction Standards (WAC 173-160) – To conduct soil remediation, several existing monitoring wells will be abandoned and several new monitoring wells will be installed to monitor the groundwater contamination levels after completion of the site cleanup action.
- SPU will obtain the appropriate permits and approvals, as necessary, from the U.S. Army Corps of Engineers, Ecology, and DPD, if regulated wetlands are identified as part of this cleanup.

4.0 SELECTED SITE CLEANUP ACTION

The selected cleanup action for this Site is complete removal and off-site disposal of the contaminated soil to the extent practicable given safety and engineering concerns. Where impracticable to remove the contaminated soil above 15 feet bgs, clean soil will be placed above the remnant COC-impacted soil and other mitigative measures will be evaluated. To allow excavation of all the contaminated areas onsite to proceed and provide sufficient operational room, all the existing structures, foundations, and appurtenances onsite will be demolished and disposed or recycled offsite. Those include the First Student Maintenance Shop and associated bus wash station and oil/water separator, Starline Maintenance Shop, the Fueling Station and UST and associated bus wash station, and the office building and interior fence on the Former Wrecking Yard (Area 3). The approximate, planned horizontal and depth of soil remediation areas are shown on Figure 3 based on existing sampling data. However, the full extent of contaminated soil in these areas will not be known until structures are demolished and excavation occurs. Following removal of the COC-impacted soil, the excavation areas will be backfilled to the design grade for future construction. Limited long-term monitoring of the groundwater will commence following re-development of the Site. A brief description of each remediation area is presented here.

Area 1

COCs in this area appear to be limited to the footprint of the fueling canopy and immediately south and east of it. Maximum concentrations of gasoline, diesel, and lead detected were 1,590, 52,600, and 300 milligrams per kilogram (mg/kg), respectively, at depths ranging from 1.5 to 9 feet bgs. The estimated surface area of the impacted soil is 3,200 sq ft. The estimated, average excavation depth of 7 feet, will generate approximately 850 CY of contaminated soil. Using a

conversion factor of 1.6 tons per CY, the total weight of the contaminated soil is approximately 1,350 tons. However, the full extent of contaminated soil will not be known until excavation activities are conducted. The excavated soil will be disposed in a permitted solid waste landfill. The excavations will be backfilled with competent imported material to grade.

Area 2

COCs in this area appear to be limited to the northern footprint of the Starline Maintenance Shop and smaller areas to the east and west. Maximum concentrations of gasoline, diesel, oil, and lead detected were 360, 4,300, 66,000, and 490 mg/kg, respectively, at depths ranging from 0.5 to 6 feet bgs. The estimated total surface area of the contaminated soil is 4,500 sq ft. An estimated average excavation depth of 4 feet will generate approximately 650 CY of contaminated soil from Area 2 and vicinity. Using a conversion factor of 1.6 tons per CY, the total weight of the contaminated soil is approximately 1,050 tons. However, the full extent of contaminated soil will not be known until the building is removed and excavation conducted. The excavated soil will be disposed in a permitted solid waste landfill. The excavations will be backfilled with competent imported material to grade.

Area 3

COCs in this area extend to most of the parcel, including the stormwater collection ditch and a small area northwest of the First Student Maintenance Shop. Maximum concentrations of gasoline, oil, benzene, arsenic, and lead detected were 540, 4,900, 2, 440, and 3,700 mg/kg, respectively, at depths ranging from 0.5 to 17 feet bgs onsite. The impacted depth in the stormwater ditch is approximately 1 foot. Toxicity characteristic leaching procedure for metals was conducted on samples from Area 3. None of the samples exceeded the threshold values for dangerous waste.

The estimated surface area and volume of contaminated soil in this area are 90,000 sq ft and 25,500 CY, respectively. Of this volume, approximately 150 CY or 250 tons is within the stormwater ditch. Approximately 70 percent, or 17,500 CY, of the impacted material is CKD. The laboratory test results indicated this material has a total density of approximately 1.4 tons per CY, which is equal to 24,500 tons. The remaining 7,850 CY is petroleum-impacted soil, mostly below the CKD and the groundwater table. This quantity weighs approximately 12,550 tons. The total estimated weight of the impacted material in Area 3 is 37,300 tons.

The excavated soil will be disposed in a permitted solid waste landfill. The excavations below the water table will be backfilled with self-compacting, imported material such as pea gravel. The remainder of the backfill will be with competent imported material to grade. In the areas where it may be impractical to remove the contaminated soil to 15 feet bgs, the extent of the COC-impacted soil remaining onsite will be surveyed prior to backfilling with clean soil. Additional mitigative measures such as the application of oxygen-releasing compound and installation of a soil vapor extraction sparge system may be considered following the evaluation of the extent of COC-impacted soil remaining onsite.

Other Areas

Singular detections of COCs such as cPAHs, chromium, and/or lead were detected in boring locations FSB, B5, B33, and B75 at depths ranging from 0.5 to 6 feet bgs. These detections were reported adjacent to the First Student Maintenance Shop building and in the eastern portion of the Site, east of the Starline Maintenance Shop building. The impacted areas appear to be limited in extent, and it is estimated that the volume of soil to be removed from these areas is approximately 20 CY. Using a 1.6 tons per CY conversion, this equates to an estimated weight of 32 tons. However, the full extent of contaminated soil will not be known until the maintenance shop is removed and excavation conducted.

5.0 ALTERNATIVES CONSIDERED

A range of potential site-wide cleanup action alternatives were evaluated in the Focused Feasibility Study (FFS) report (AMEC 2009b). This section summarizes the cleanup technologies and alternatives considered, and the basis for selection of the site-wide remedy.

5.1 Cleanup Technologies

The FFS presents a detailed screening evaluation of potentially applicable general response actions and remediation technologies. The study was a focused one, and the remedial technologies were limited to the proven techniques, presumed remediation techniques applicable to the Site, and those acceptable to Ecology. The screening evaluation was carried out for soil requiring cleanup action evaluation. During the development of the FFS, cleanup action alternatives were developed by assembling the technologies that were carried forward from this screening evaluation.

5.2 Focused Feasibility Study Alternatives

The FFS presented a detailed evaluation of a range of potential cleanup action alternatives for remediation of contaminated Site soil. Those alternatives were: 1) No Action, 2) *In-Situ* Stabilization, 3) *In-Situ* Containment, 4) *Ex-Situ* Containment, and 5) Removal and Off-site Disposal. The detailed description and components for each alternative is presented in the FFS. The FFS also presents detailed evaluation of the alternatives with respect to seven evaluation criteria and the RAOs. The RAOs established for the remedial effort were:

- Minimize or eliminate direct human exposure to COCs;
- Minimize or eliminate direct ecological receptor exposure to COCs;
- Reduce the potential for COCs to migrate from site soil to groundwater at concentrations greater than cleanup levels, where human receptors, such as a future excavation worker, may potentially be exposed; and
- Reduce the potential for COCs to leach into the groundwater above the cleanup levels and migrate offsite.

Comparison of the alternatives with respect to each evaluation criterion and the RAOs are presented in Section 5.3.

5.3 Evaluation of Alternatives

The evaluation of the alternatives was based on MTCAs disproportionate cost analysis (DCA) that identifies which of the alternatives meeting MTCA threshold requirements are permanent to the maximum extent practicable. This analysis compares the relative benefits and costs of cleanup alternatives in selecting the alternative whose incremental cost is not disproportionate to the incremental benefits. The seven criteria used in the DCA, as specified in WAC 173-340-360(2) and (3), are:

- Protectiveness;
- Permanence;
- Cost;
- Long-term Effectiveness;
- Management of Short-term Risks;
- Implementability; and
- Consideration of Public Concerns.

The evaluation of the selected alternative, Alternative 5 – Removal and Off-site Disposal (Alternative 5), for each of the evaluation criteria is discussed below.

5.3.1 Protectiveness

Alternative 5 is the most protective alternative because it removes the contamination source from the Site and eliminates the COCs from coming into contact with the groundwater and humans and other ecological receptors. Other alternatives offer decreasing levels of protectiveness, however, they do not eliminate the possibility of leaching of COCs into the groundwater.

5.3.2 Permanence

Alternative 5 would remove the source of the COCs from the Site and therefore, offers the most permanent remediation alternative. Alternative 5 also includes dewatering which will have a permanent improvement on groundwater quality. Removal of the contaminated soil will ensure that there will not be any possibility of future physical or chemical changes that might allow further release of COCs into the groundwater, which could occur if the material was left *in-situ*, or allow humans and other ecological receptors from coming into contact with the COCs.

5.3.3 Cost

Alternative 5 has the lowest project cost ($10.2 million) and Alternative 2 – *In-Situ* Stabilization has the second lowest cost ($10.6 million). These ranges of costs are considered within

reasonable and acceptable range. The level of permanence and effectiveness of Alternative 5 is judged to offer a better value over the long term.

5.3.4 Long-term Effectiveness

Alternative 5 is the most effective remediation in the long term by removing the COCs from the site. Other alternatives would likely continue to release several or all COCs into the groundwater in the long term, although at a slower rate than the existing condition.

5.3.5 Management of Short-term Risks

Alternative 3 – *In-Situ* Containment would have the least risk during construction due to the need to handle the lowest volume of contaminated soil. Alternative 5 would have higher risk during construction due to the volume of contaminated soil and groundwater that need to be handled and the nature of waste management. In Alternative 5 the contaminated soil would be loaded directly onto trucks and transported offsite as the excavation occurs, thus minimizing its handling and associated risk.

5.3.6 Technical and Administrative Implementability

Alternative 5 has the least number of components and features and therefore is considered to be the least difficult to implement and it would require the least amount of long-term monitoring (LTM). This alternative would also have the least requirement for quality control and quality assurance, as only confirmation samples would be needed to verify that cleanup goals have been achieved. Furthermore, Alternative 5 would receive the quickest regulatory approval since the contamination source will be removed from the Site.

5.3.7 Public Concerns

There are no known, site-specific concerns by the public. However, our experience at other sites indicates that source removal has always had the highest degree of public approval. Therefore, Alternative 5 is considered to be the most publicly acceptable approach to remediation of this site.

5.3.8 Meeting RAOs

Alternative 5 meets all the RAOs completely since all contamination sources (contaminated soil) are removed from the Site. Other alternatives only meet most of the RAOs or with some risk, since the source of the contamination would remain onsite.

6.0 CLEANUP ACTION INPLEMENTATION

The cleanup implementation will include the following elements which are discussed in further detail in following subsections:

- Site Setup;
- Hazardous Material Abatement;

- Demolition;
- Contaminated Soil Excavation; and
- Monitoring Well Installation.

6.1 Site Setup

At the start of the project, a silt fence and an earthen berm wrapped in plastic sheeting will be installed around the perimeter of the excavation areas. The existing drain systems would be plugged to prevent discharge of stormwater through the subsurface pipes. The Area 3 interior fence will be removed, and the interior stormwater collection ditch will be blocked at its discharge point at the property line and used for stormwater collection. Stormwater will then be pumped into temporary holding tanks to allow the suspended solids to settle prior to testing and discharge into the public-owned treatment wastewater (POTW) facility. If the testing indicates the presence of pollutants or suspended solids above the permissible levels, it would be treated, tested, and then discharged into the POTW. The existing sanitary sewer line at the office in the western portion of the Site or the First Student Maintenance Shop will be used to discharge the water.

If soil stockpile staging areas are required, they will be bermed and lined with plastic sheeting to prevent impact to the existing ground surface. The stockpiles would be covered with plastic sheeting to prevent the stormwater from coming into contact with the soil. Any accumulated stormwater would be pumped into the holding tanks and handled as described above.

A temporary decontamination station or truck wash may be installed at each work area, if needed to prevent tracking of contaminated soil. Decontamination rinsate generated during the project would be collected, characterized, and either disposed into the sanitary sewer (if permitted to do so) or offsite.

All utilities will be de-activated at the property line. Subsurface pipes will be capped at the buildings and the property line and grouted. Aboveground lines will be removed as part of demolition. Existing catch basins and floor drains will be plugged and subsurface stormwater lines will be grouted in place.

The existing monitoring wells within the work areas will be abandoned to allow the remediation work and future site development to proceed. A total of ten shallow monitoring wells, MW-1 through MW-6, MW-9, MW-10, MW-16, and MW-17, and two deep wells MW-18 and MW-20 will be abandoned. The wells are illustrated on Figure 3. Following the completion of site development, a new monitoring well network will be designed.

6.2 Hazardous Material Abatement

A hazardous material survey was conducted by AMEC in 2008. Two sinks were identified with asbestos-containing undercoating that require abatement. These sinks will be removed and disposed as asbestos-containing material. Asbestos was also found in the drywall putty in the First Student Maintenance Shop, but less than 1 percent in content. The Department of OSHA

requires personnel monitoring during demolition, but abatement prior to demolition will not be required.

Other known hazardous materials are fluorescent light bulbs and light ballasts containing polychlorinated biphenyls (PCBs). The light bulbs will be removed intact and transported to a recycling facility to reclaim the mercury vapors. All light ballasts will be checked and those not clearly marked as "Non-PCB" will be removed and disposed offsite. Any other regulated substances identified will be removed and disposed or recycled offsite as appropriate.

6.3 Demolition

The site structures will be demolished to 3 feet below grade or to the bottom of the foundations, whichever is less. Recyclable material will be segregated, sized, and shipped offsite to an approved facility for recycling. All other waste generated will be disposed offsite as demolition debris.

Any contaminated concrete identified will be segregated and disposed offsite. All uncontaminated concrete pavement, slabs, and foundations will be recycled offsite. The economics of crushing the concrete and reusing onsite as backfill material above the groundwater table, will be evaluated during design. All asphalt pavement will be removed and recycled offsite.

Demolition will include the decommissioning and removal of the fuel UST in Area 1 and the oil/water separator north of the First Student Maintenance Shop. These activities will be conducted in accordance with Washington State UST regulations (WAC 173-360) and Ecology's *Guidance for Site Checks and Site Assessments for USTs* (Publication No. 90-52 1991, revised May 2003).

Engineering controls such as wetting will be employed to control fugitive dust generation and migration. Areas where paint chips containing lead are found will be stripped and disposed offsite after demolition.

6.4 Contaminated Soil Excavation

Most of the contaminated soil is above the groundwater table. Approximately 44 percent of the excavation area, located in the central portion of Area 3, is below the groundwater table. All contaminated soil above the groundwater table will be removed and disposed offsite prior to excavating below the groundwater table. Excavation in Areas 1 and 2 will be backfilled with clean, imported soil, upon receipt of satisfactory analytical results from confirmation sampling.

Excavation below the groundwater table in Area 3 will be conducted in steps to minimize the size of the open excavation and the amount of dewatering required. The excavation along the western property boundary will be shored or sloped at 1 Horizontal to Vertical (1H:1V) to the bottom of the excavation for sidewall safety. Excavations will be backfilled as soon as satisfactory confirmation test results are obtained or it is determined that additional excavation or removal is impractical. In the areas where it is impractical to completely remove the COC-

impacted soil, the extent of the COC-impacted soil remaining onsite will be surveyed prior to backfilling with clean soil. Additional mitigative measures will be considered following the evaluation of the extent of COC-impacted soil remaining onsite. Mitigative measures such as the application of oxygen-releasing compound and installation of a soil vapor extraction sparge system may be considered following the evaluation of the extent of COC-impacted soil remaining onsite.

Backfill below the groundwater table will be by self-compacting material such as pea gravel or crushed rock. The remainder of backfill to grade will be by competent imported material. The final grades will have positive slope toward the perimeter ditch.

6.5 Monitoring Well Installation

After completion of all earthwork and site work, new monitoring wells will be installed in accordance with well construction standards. A new monitoring well network will be designed upon completion of the final facility design and evaluation of the Site groundwater gradient post Site remediation. It is anticipated that the monitoring well network will include eight existing wells onsite.

7.0 COMPLIANCE MONITORING

There are three types of compliance monitoring identified for interim or remedial cleanup actions performed under MTCA (WAC 173-340-410): Protection, Performance, and Compliance Monitoring. The definition of each is presented below (WAC 173-340-410 [1]):

- Protection Monitoring –To confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action as described in the safety and health plan.
- Performance Monitoring – To confirm that the cleanup action has attained cleanup standards and other performance standards such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws.
- Confirmation Monitoring – To confirm the long-term effectiveness of the cleanup action once cleanup standards and other performance standards have been attained.

This cleanup action involves all three monitoring types. Each type is discussed here.

7.1 Protection Monitoring

A separate health and safety plan (HASP) will be prepared for the cleanup action that meets the minimum requirements for such a plan identified in federal (Title 29 CFR, Parts 1910.120, and 1926) and state regulations (WAC Title 296). The protection monitoring will include personal and perimeter air sampling for asbestos during abatement and for lead and volatile organic compounds during earthwork. The frequency of sampling and period of monitoring will be established in the HASP.

7.2 Performance Monitoring

The objectives for performance monitoring are to demonstrate compliance with the MTCA cleanup regulations and DPD permit specifications, and to document the property conditions upon completion of the cleanup action. To demonstrate such compliance, the following separate performance monitoring activities are planned during the CAP implementation:

- Waste Profile for Off-site Treatment or Disposal;
- Confirm that Cleanup Levels Have Been Achieved; and
- Structural Use of Imported Fill Material.

The sampling and analysis plans for each performance monitoring activity are described in the following sections.

7.2.1 Waste Profiling for Off-site Treatment or Disposal

Wastes generated during the implementation of the CAP will require characterization and profiling prior to shipment offsite. Usually, the minimum number of samples and analytical tests are specified by the receiving facility. Wastes that will be generated during the CAP implementation include:

- UST contents (diesel);
- UST cleaning/rinsing solutions;
- Demolition debris;
- Recyclable waste;
- Contaminated soil excavated; and
- Miscellaneous solid wastes.

Each waste stream will be profiled separately in accordance with the minimum waste analysis requirements of the respective receiving facility.

7.2.2 Confirm That Cleanup Levels have been Achieved

Confirmation soil samples will be collected from the sidewalls and bottoms of the excavation area. In excavations of less than 10 feet in any direction, two sidewalls and the bottom will be sampled. In excavations between 10 and 50 feet in any direction, four sidewalls and bottom will be sampled. In excavations larger than 50 feet in any direction, sidewalls will be sampled every 50 feet, and the bottom will be sampled on a 50-foot grid.

Samples collected will be analyzed for the COCs specific to that location. If a value exceeds the relevant MTCA Method A cleanup level (or Method B cleanup level where no value is given), then the area represented by the sample will be excavated another 1 foot and re-sampled and tested for the analyte with the exceedance. This step-procedure will be followed until the cleanup level is achieved or the property boundary is reached. In the areas where additional

excavation is not feasible (*e.g.,* property boundary, steep slopes of the excavation), the statistical approach might be employed to verify if the cleanup standards have been achieved in accordance with the statistical guidance provided by Ecology (Ecology 1992).

7.2.3 Structural Use of Imported Fill Material

The imported fill will be tested for geotechnical properties to confirm its structural integrity for the future site development and analyzed for the primary COCs and other analytes that are deemed appropriate such as arsenic. It is assumed that one sample from every type of material or every 5,000 tons, whichever is more, will be tested. Samples failing geotechnical performance criteria or showing exceedance of any analyte will be rejected.

Compaction testing of the fill will also be performed. The compacted fill will be tested to ensure a minimum of 95 percent of the maximum dry density, as determined by ASTM D-1557, is achieved. The moisture content will be monitored during site placement and compaction.

7.3 Confirmation (Long-Term) Monitoring

Groundwater samples will be collected following completion of the soil remediation to establish the baseline concentrations of the COCs in groundwater. Groundwater samples will be collected from the new monitoring well network to be developed post site remediation. Quarterly monitoring will be conducted to evaluate natural attenuation of the COCs. The groundwater conditions and monitoring program will be evaluated for a period of two years.

7.4 Reporting

Upon completion of the cleanup activities, an independent remedial action report documenting the implementation of the CAP will be prepared and presented to Ecology within 90 days of completion in accordance with the WAC 173-340-515(4). The report will describe the results of the remedial activities conducted onsite, including any additional investigation or monitoring conducted during the cleanup, to allow Ecology to evaluate whether the cleanup action meets the substantive requirements set forth in WAC Chapter 173-340.

8.0 SCHEDULE FOR IMPLEMENTATION

The cleanup action described in this CAP will be completed within a reasonable time. The anticipated implementation schedule for cleanup action is during the summer and fall of 2009. Within 90 days of demobilization from the Site, an independent cleanup action report will be submitted to Ecology for review.

9.0 LIMITATIONS

This report was prepared exclusively for the City of Seattle by AMEC. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation; ii) data supplied by outside sources; and iii) the assumptions, conditions, and qualifications set forth in this report and AMEC proposal. This report is intended to be used by the City for the Site only, subject to the terms and conditions of the City contract with AMEC. Any other use of, or reliance on, this report by any third party is at the sole risk of the party.

10.0 REFERENCES

AMEC Earth & Environmental, Inc. (AMEC). (2009a). *Remedial Investigation Report*, Bothell, Washington. March.

AMEC Earth & Environmental, Inc. (AMEC). (2009b). *Focused Feasibility Study Report*, Bothell, Washington. March.

Cowardin, L.M., Carter, V., Golet, F.C., and LaRoe, E.T. (1979). Classification of Wetlands and Deepwater Habitats of the United States: U.S. Fish and Wildlife Service, Office of Biological Services, Publication FWS/OBS/79/31, Washington, D.C.

DPD (Seattle Department of Planning and Development). (2007). DPD GIS Virtual Earth Version 2.2.6: Seattle Department of Planning and Development, Washington. http://web1.seattle.gov/dpd/maps/dpdgis.aspx (accessed on December 12, 2008).

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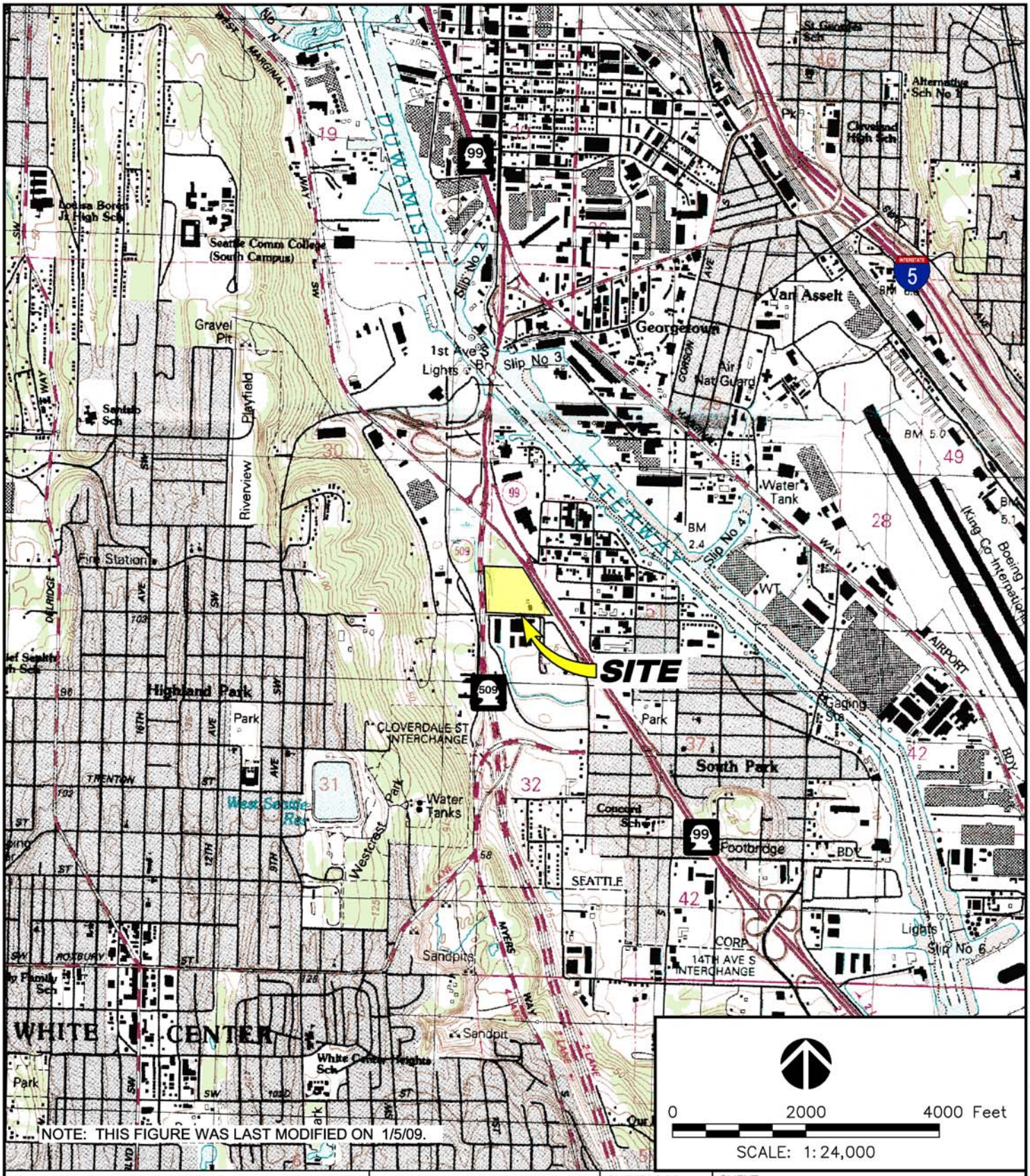
TABLES

Table 1
Cleanup Levels for Soil
South Kenyon Street Bus Yard Site
Seattle, Washington

Chemicals	Cleanup Level (mg/kg)
TPH Diesel Range	2,000
TPH Lube Oil Range	2,000
TPH Gasoline Range	30
Benzene	0.03
Arsenic	20
Lead	250

Notes:
Cleanup Level = MTCA Method A CULs for Unrestricted Land Use
TPH = Total Petroleum Hydrocarbons
mg/kg = milligrams per kilogram

FIGURES



NOTE: THIS FIGURE WAS LAST MODIFIED ON 1/5/09.

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

CLIENT LOGO

CLIENT: CITY OF SEATTLE

PROJECT: SOUTH KENYON STREET BUS YARD SITE	DWN BY: JRS	DATUM: NAD83	DATE: MARCH 2009
TITLE: SITE LOCATION MAP	CHK'D BY: AS/CI	REV. NO.:	PROJECT NO: 8-915-16289-A
	PROJECTION: WA STATE PLANE	SCALE: AS SHOWN	FIGURE No. 1

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LEGEND

- SITE BOUNDARY
- TOPOGRAPHIC CONTOUR
- CONCRETE SURFACE

SOURCE: SPU SURVEY MAP, DATED 6/14/07.

SR 509 ACCESS ROAD

S HOLDEN ST

0 100 200

SCALE IN FEET

DRAINAGE DITCH

S PORTLAND ST

SR 99

FORMER WRECKING YARD

FUEL DISPENSER CANOPY

BUS WASH

UST (DIESEL)

STORM WATER LINE

OIL-WATER SEPARATOR

BUS WASH

S CHICAGO ST

FIRST STUDENT MAINTENANCE SHOP/OFFICE

STARLINE MAINTENANCE SHOP/OFFICE

FORMER 2ND AVENUE DITCH

1ST AVE S

SR 509

SHED

S KENYON ST

S KENYON ST

S KENYON ST

SECTION LINE

CLIENT LOGO

CLIENT: CITY OF SEATTLE

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98011-8201

DWN BY:	JRS
CHK'D BY:	AS/CI
DATUM:	HPGN (HARN)
PROJECTION:	WA STATE PLANE
SCALE:	AS SHOWN

PROJECT: SOUTH KENYON STREET BUS YARD SITE

TITLE: SITE PLAN

DATE:	MARCH 2009
PROJECT NO:	8-915-16289-A
REV. NO.:	
FIGURE No.	2

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LEGEND

- SITE BOUNDARY
- B47 — PUSH PROBE SOIL BORING LOCATION *(JULY 2008)*
- B-3 — SOIL BORING LOCATION/ TEMPORARY WELL
- MW-6 — MONITORING WELL LOCATION
- AB — ANGLE BORING LOCATION
- DITCH-W — HAND AUGER SAMPLE LOCATION
- EXCAVATION AREA
- APPROXIMATE AREA REQUIRING DEWATERING

SOURCE: SPU SURVEY MAP, DATED 6/14/07.

0 100 200
SCALE IN FEET

AREA 3 EXCAVATION
AREA 1 7' DEEP EXCAVATION (AVERAGE)
AREA 2 4' DEEP EXCAVATION
1' DEEP EXCAVATION
7' DEEP EXCAVATION
2' DEEP EXCAVATION
1' DEEP EXCAVATION
2' DEEP EXCAVATION

SR 509
SR 99
W MARGINAL WAY S
S PORTLAND ST
S CHICAGO ST
S KENYON ST
STORM WATER LINE

CLIENT LOGO

CLIENT: CITY OF SEATTLE

AMEC Earth & Environmental
11810 North Creek Parkway North
Bothell, WA, U.S.A. 98034-8201

DWN BY: JRS
CHK'D BY: CI
DATUM: HPGN (HARN)
PROJECTION: WA STATE PLANE
SCALE: AS SHOWN

PROJECT: SOUTH KENYON STREET BUS YARD SITE

TITLE: SOIL REMEDIATION AREAS

DATE: MARCH 2009
PROJECT NO: 8-915-16289-A
REV. NO.:
FIGURE No. 3

M:\amec\16289A – South Recycling and Disposal Station\16289A – South Recycling and Disposal Station\SPU File\16289–A–11–AS_SoilRemediationAreas_033009.dwg – Boring Locations – Mar. 30, 2009 5:22pm – adam.stenberg